UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MEMORANDUM

DATE: January 3, 2013

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

SUBJECT: Joint Science Review with Health Canada Pest Management Regulatory Agency (PMRA) in Support of the Registration of AMV-1018 Technical Containing 98.0% of 3-Decen-2-One as its Active Ingredient.

Decision Numbers:	425383
DP Number:	406421 and 407458
EPA File Symbol Number:	5481-LAI
EPA Petition Number:	9F7670
Chemical Class:	Biochemical
PC Code:	068403
CAS Number:	10519-33-2
Active Ingredient Tolerance:	Pending
MRID Numbers:	48970301-48970304 and 49011001

FROM: Angela L. Gonzales, Biologist 1/3/13
Biochemical Pesticides Branch
Biopesticides & Pollution Prevention Division (7511P)

THROUGH: Felecia A. Fort, Acting Associate Director 1/3/13
Biopesticides & Pollution Prevention Division (7511P)

TO: Colin G. Walsh, M.S., Regulatory Action Leader
Biochemical Pesticides Branch
Biopesticides & Pollution Prevention Division (7511P)

ACTION REQUESTED

AMVAC Chemical Corporation requests registration of **AMV-1018 Technical**, a new manufacturing-use product (MP) containing 98.0% of the new active ingredient (a.i.), 3-decen-2-one for use as a potato sprout inhibitor. 3-decen-2-one occurs naturally in some foods and is approved as a direct food additive by the U.S. Food and Drug Administration (FDA) for use as a synthetic flavoring agent and adjuvant (21 CFR 172.515). In response to the request for additional information discussed in the memorandum from C. G. Walsh to J.

Fournier dated 11/08/11 and a memorandum from C. G. Walsh to L. Hollis dated 12/20/11 and relayed in a letter to the applicant dated 1/30/12, the applicant has submitted a revised Confidential Statement of Formula (CSF) dated 10/11/12, product chemistry data in MRID 48970301, toxicology data in MRIDs 48970302-48970303 and residue data in MRID 48970304. Additional data and information were also submitted in MRID 49011001. A request for registration of an end-use product (EP), (AMV-1018 EP, EPA File Symbol No. 5481-LTR) has been submitted concurrently and is discussed in a separate memorandum from A. L. Gonzales to C. G. Walsh dated 01/03/2013. EPA is conducting a joint review for these products with Canada's PMRA.

RECOMMENDATIONS AND CONCLUSIONS

1. The product chemistry submission is ACCEPTABLE
MRID 48970301: ACCEPTABLE

a. All product chemistry data requirements have been satisfied.

2. The toxicology submission for the active ingredient is ACCEPTABLE.
MRID 48970302: ACCEPTABLE **MRID 48970303: ACCEPTABLE**

a. All mammalian toxicology data requirements have been satisfied.

3. The petition for the exemption from the requirement of a tolerance for 3-decen-2-one is ACCEPTABLE.
MRID 48970304: ACCEPTABLE **MRID 49011001: SUPPLEMENTAL**

a. The qualitative risk assessment conducted by the Agency for use of 3-decen-2-one supports the petition for an exemption from the requirement of a tolerance.

RISK ASSESSMENT AND STUDY SUMMARIES

I. Active Ingredient Characterization

A. Product Chemistry (MRID 48970301)

*A Data Evaluation Record (DER) was not created for MRID 48970301

All product chemistry data requirements have been satisfied. Refer to the memoranda from C. G. Walsh to J. Fournier and C. G. Walsh to L. Hollis dated 11/8/11 and 12/20/11, respectively for more information. The CSF has been adequately revised according to the Agency's requests. An acceptable one-year storage stability study conducted on the product was submitted in MRID 48970301. The study was conducted on the product in high density-polyethylene (HDPE) containers for one year. Following initial characterization of the active ingredient, the product was stored under ambient laboratory conditions and subsequently analyzed by gas chromatography

for active ingredient content at 3, 6, 10 and 12 months. The integrity of the storage container was also monitored at these time points. No physical changes to the test substance were reported throughout the study. There were no signs of cracking, pitting or discoloration on the product containers. The active ingredient content remained within the certified limits on the CSF throughout the study. The product is considered stable in an ambient environment under the conditions of the study.

II. Human Health Assessment

A. Toxicology (MRIDs 48970302-48970303)

All mammalian toxicology data requirements have been satisfied. Refer to the memorandum from C. G. Walsh to L. Hollis dated 12/20/11 for more information. An update to the discussion of the 90-day oral toxicity data requirement is provided below. Acceptable developmental toxicity data were submitted in MRIDs 48970302-48970303 and are also discussed below. A summary of the data available for 3-decen-2-one is presented in Table 1.

Table 1: Mammalian Toxicology Data Requirements for 3-Decen-2-One (40 CFR § 158.2050)

Study/OCSPP Guideline No.	Results	Toxicity Category/Description	MRID
Acute oral toxicity (rat) (870.1100)	LD_{50} > 5,000 mg/kg body weight in female rats	Toxicity Category IV	*47942609*
Acute dermal toxicity (rat) (870.1200)	LD_{50} > 5,000 mg/kg body weight in male and female rats	Toxicity Category IV	*47942610*
Acute inhalation toxicity (rat) (870.1300)	LC_{50} 0.52-2.04 mg/L in male rats and > 2.04 mg/L in female rats	Toxicity Category III	*47942611*
Primary eye irritation (rabbit) (870.2400)	One hour after test substance instillation, all three treated eyes exhibited corneal opacity and conjunctivitis, and two treated eyes exhibited iritis. Severity decreased over time, with all animals free of ocular irritation by Day 10. Test substance is classified as moderately irritating to the eye.	Toxicity Category II	*47942612*
Primary dermal irritation (rabbit) (870.2500)	Animals exhibited severe irritation (severe erythema and moderate edema) through 72 hours post patch removal. Irritation was no longer observed by Day 14. Test substance is classified as severely irritating to the skin.	Toxicity Category II	*47942613*
Dermal sensitization (guinea pig) (870.2600)	Not a dermal sensitizer.	-	*47942614*

Table 1: Mammalian Toxicology Data Requirements for 3-Decen-2-One (40 CFR § 158.2050)			
Study/OCSPP Guideline No.	**Results**	**Toxicity Category/Description**	**MRID**
90-Day oral toxicity (870.3100)	Adequate rationale and data from the literature were submitted to satisfy the data requirement. The active ingredient is not likely to cause unreasonable adverse effects based on the following: 1) humans are already exposed naturally to 3-decen-2-one, as it occurs naturally in some foods; 2) the Food and Drug Administration (FDA) has approved the use of the chemical as a food additive without limitations; 3) metabolism data and information indicate that the chemical will be metabolized into innocuous compounds; and 4) no relevant toxicological endpoints were identified by a high throughput screening computer program (DEREK Nexus) that predicts the potential for toxicity.	-	*47942617* *48422301*
90-Day dermal toxicity (870.3250)	Not required. Proposed uses not to involve purposeful application to human skin and do not result in comparable human exposure to the product.	-	*47942617*
90-Day inhalation toxicity (870.3465)	Not required. Repeated inhalation exposure is unlikely due to product being applied by a thermal fog generator in a closed system. Personnel are not allowed in the potato storage facilities during application and evacuation of the product. In addition, any unlikely inhalation exposure will be mitigated on the label by precautionary statements and PPE requirements.	-	*47942617;* *48422301*
Developmental toxicity (870.3700)	Maternal and fetal NOAEL = 1,000 mg/kg/day (the highest dose tested)	-	48970303
Mutagenicity (870.5100, 5300 and 5375)	Test substance is negative in bacterial reverse mutation assay with and without metabolic activation. Test substance positive in 24-hr exposure without metabolic activation and equivocal results with metabolic activation in an *in vitro* mammalian gene mutation assay (mouse lymphoma cell). Mouse lymphoma results are considered equivocal because it is not clear whether the positive results would translate into an *in vivo* system based on the increased osmotic pressure and marked cytotoxicity noted during the experiment.	-	*47942616* *47942615*
Mutagenicity – Tier II (870.5395)	Test substance is considered non-mutagenic based on *in vivo* mammalian erythrocyte micronucleus test assay results.		*48412402*

1. Subchronic Toxicity: 90-Day Oral Toxicity

A guideline subchronic 90-day oral toxicity study is not available for 3-decen-2-one; however, in support of this requirement, the applicant submitted a study (Munro et al., 1999) in which subchronic, chronic, reproductive

and developmental toxicity data were gathered for over 600 substances which included industrial chemicals, pharmaceuticals, food substances and other chemicals likely encountered in commerce. Using the data, a 5th percentile no-observed-effect- level (NOEL) for the structural class II flavoring agents to which 3-decen-2-one belongs was determined. The 5th percentile NOEL was chosen as a conservative NOEL in order to represent chemicals of unknown toxicity in the class; thus, there would be 95% confidence that any chemical in structural class II of unknown toxicity would have a NOEL greater than the 5th percentile NOEL of 0.906 mg/kg/day. The active ingredient was considered a chemical of unknown toxicity and therefore is represented by the 5th percentile NOEL. For additional information, refer to the memorandum from C. G. Walsh to L. Hollis dated 12/20/11. The information submitted by the applicant is considered supplemental in the hazard assessment because data specific to 3-decen-2-one were not provided in the study and a lowest-observed-effect-level (LOEL) is not available with respect to the NOEL. Additionally, the 0.906 mg/kg/day NOEL is considered to be very conservative and is likely a considerable overrepresentation of the actual NOEL of the active ingredient.

Although an adequate 90-day oral toxicity study has not been submitted, the Agency has determined that 3-decen -2-one is not likely to cause unreasonable adverse toxicological effects via the oral route of exposure by using a weight of the evidence (WOE) approach. This determination is based on the following: 1) humans are already exposed naturally to 3-decen-2-one, as it occurs naturally in some foods; 2) the Food and Drug Administration (FDA) has approved the use of the chemical as a food additive without limitations; 3) metabolism data and information indicate that the chemical will be metabolized into innocuous compounds; and 4) the only relevant toxicological endpoints identified by an expert system computer program (Derek Nexus) were not supported by experimental data on 3-decen-2-one. These statements are discussed in detail in the subsequent paragraphs. For the aforementioned reasons, the data and information submitted for 3-decen-2-one are sufficient to satisfy the 90-day oral toxicity data requirement and support a safety finding for the active ingredient in lieu of a study.

The active ingredient has been found to naturally occur in yogurt, skipjack tuna, edible porcini mushrooms and Iberian ham (Thomas, 1973; Timon et al., 1998; Song et al., 2004; and Patrignani et al., 2009). Additionally, in a 2003 report, the Joint FAO/WHO Expert Committee on Food Additives (JECFA) indicated that 3-decen-2-one is one in a group of compounds that have been identified in fruits, vegetables, spices, cocoa, coffee and tea. JECFA also concluded in their report that there is no safety concern at current intake levels when the chemical is used as a flavoring agent. The chemical has been approved by FDA as a food additive without limitation under 21 CFR § 172.515. According to a report by an independent panel of experts retained by the Flavor and Extract Manufacturer's Association (FEMA), 3-decen-2-one is considered safe for its intended use when added at an average maximum level of 19 ppm in baked goods, 7.8 ppm in soft candy, 5.8 ppm in frozen dairy products, 4.8 ppm in gelatins and puddings, 4.3 ppm in non-alcoholic beverages and 4.0 ppm in alcoholic beverages (Oser & Ford, 1978).

The metabolic pathways of 3-decen-2-one have been characterized by JECFA in their 2003 report and it was determined that the chemical is metabolized in humans into innocuous compounds. Metabolic pathways were defined to be either: 1) reduction of the ketone followed by glucuronic acid conjugation of the corresponding alcohol or direct glucuronic acid conjugation of the secondary alcohol; 2) reduction of the ketone functional

group followed by glucuronic acid conjugation of the resulting alcohol and glutathione conjugation of the parent ketone; or 3) reduction of the ketone and alkyl side-chain oxidation. The end-products of these pathways are either excreted or further metabolized in the fatty acid pathway or citric acid cycle. In the environment, the active ingredient degrades into 2-decanol and 2-decanone. These degradates are discussed in further detail on page 12 of the memorandum from C. G. Walsh to L. Hollis dated 12/20/11.

3-Decen-2-one was analyzed with DEREK Nexus (LHASA Ltd.), an expert system for the prediction of toxicity. It relies on a knowledge base of structural alerts and rules developed by scientists. When a test compound is inputted into the program, DEREK Nexus scans the test compound for structural alerts contained within its database that are associated with specific toxicological endpoints and applies a series of reasoning rules to determine the likelihood of toxicity for the test compound. Information is provided on the rules used to make the prediction, along with descriptions of structural alerts identified, comments, available example compounds linked to the alerts and literature references. Because 3-decen-2-one contains a reactive α,β-unsaturated ketone, alerts for potential dermal sensitization and *in vitro* chromosome damage were identified by the program; however, a chemical-specific dermal sensitization study conducted on the active ingredient indicated that 3-decen-2-one is not a dermal sensitizer under the conditions of the study and a mammalian erythrocyte micronucleus assay conducted on 3-decen-2-one indicated that the chemical does not induce chromosome damage in vivo. No other alerts were identified by DEREK Nexus.

2. Prenatal Developmental Toxicity

*Data Evaluation Records (DERs) were not created for MRIDs 48970302-48970303

Sufficient data have been submitted to satisfy the prenatal developmental toxicity data requirement. Based on a review of the data submitted to the Agency, 3-decen-2-one is not anticipated to be a developmental toxicant.

An acceptable range-finding prenatal developmental toxicity study was submitted in MRID 48970302 which indicated that a dose of 1,000 mg/kg/day was suitable as the high dose for the main developmental toxicity study. No evidence of maternal toxicity was observed. At 1,000 mg/kg/day, slight reductions in bodyweight gain and food consumption were observed which were mainly attributable to one female which had a low individual bodyweight gain and a comparatively small litter size. These effects were considered to be incidental to treatment. Developmental toxicity was also not observed.

An acceptable prenatal developmental toxicity study was submitted in MRID 48970303. In the study, Crl:CD Sprague-Dawley rats were administered doses of AMV-1018 (99.81% purity 3-decen-2-one) by gavage at 0, 100, 300 or 1,000 mg/kg/day from day 6 to day 19 of gestation. Each treatment group consisted of 24 female rats; the control group which received corn oil, the test substance vehicle, also consisted of 24 female rats. At day 0 of gestation, animals were approximately 71-74 days old, within a weight range of 232-285g and healthy in appearance. Animal acclimatization, housing, diet, and water supply were reported adequately. Test substance characterization and preparation was also reported adequately. Animals were dosed once a day at approximately the same time each day. Clinical observations occurred at least twice daily and detailed observations were

recorded daily on completion of dosing, between one and two hours post-treatment and as late as possible in the working day. A detailed physical examination was performed on each animal on days 0, 5, 12, 18 and 20 after mating, bodyweights were measured on days 0, 3 and 6 through 20 after mating and food consumption was measured throughout the study. Animals were sacrificed on day 20 after mating by carbon dioxide asphyxiation. Fetuses were sacrificed via chilling on a cold plate at approximately 0°C. All animals were necropsied. Macroscopic observations included examinations of all tissues, external features and orifices. Gravid uterine weights, the number of corpora lutea in each ovary, the number of implantation sites, the number and distribution of resorption sites and live and dead fetuses were recorded. All fetuses and placentae were dissected from the uterus, weighed individually, and externally examined. Fetuses were also sexed and examined for visceral abnormalities and skeletal development and abnormalities. Statistical analyses of the data were provided in the study. No maternal deaths or clinical signs related to treatment were observed in the study. Salivation was observed in all animals in the intermediate- and high-dose groups during the treatment period. Chin rubbing, which is associated with salivation, was observed in some animals in the high-dose group. These observations were considered to be attributable to the palatability of the test substance and not toxicologically significant. Bodyweight gain in the low- and intermediate-dose groups was not affected by treatment. When compared to the control group, overall mean bodyweight gain in the high-dose group was slightly low during gestation which was associated with slightly lower food consumption in the high-dose group. This observation was considered to be attributable to the palatability of the test substance and not considered toxicologically significant. Food consumption in the low- and intermediate-dose groups was unaffected by treatment. Gravid uterine weights were not affected by treatment in any group. There were no maternal treatment-related macroscopic effects. All females in each test group were pregnant. Mean corpora lutea, implantations, early, late and total resorption counts, live young, sex ratio, pre- and post-implantation loss, litter weight, placental weight, male and female fetal weight and overall fetal weight were all considered to be unaffected by treatment at all doses. In all dose groups, no relationship to treatment was observed in the incidence of major and minor fetal abnormalities and skeletal variants. There was a slight increase in the percentage of incidences of fetuses with 13/14 and 14/14 ribs in all dose groups when compared to the control group, but the incidences were similar to historical control data, and in the absence of other related findings in the study, the observations were not considered to be treatment related. Based on the lack of systemic maternal and fetal toxicity, the no-observed-adverse-effect-level (NOAEL) for maternal and fetal toxicity is 1,000 mg/kg/day.

B. Dose Response Assessment

No toxicological endpoints have been identified; therefore, a dose response assessment is not required at this time.

C. Food Quality Protection Act (FQPA) Considerations

1. Dietary Exposure and Risk Characterization

Human exposure to 3-decen-2-one may occur via dietary exposure to treated potatoes. A qualitative risk assessment was conducted for the chemical to assess potential risks (if any) from dietary exposure. Although

dietary exposure to humans may occur, the Agency has determined that there is reasonable certainty of no harm to humans when exposed to residues of the active ingredient from pesticidal use when label instructions are followed. This conclusion is based on the following: 1) available toxicology data and information indicate that the active ingredient is of low toxicity (with the exception that it is an eye and skin irritant) and not likely to be a developmental toxicant, a mutagen or toxic via repeat oral exposure; 2) humans are already exposed to 3-decen-2-one in the diet from foods that naturally contain the chemical and from foods to which the chemical has been added as a food additive; 3) metabolism data and information on the chemical indicate that it is metabolized into innocuous substances in humans; and 4) deterministic exposure analyses suggest that dietary exposure to the chemical as a pesticide is likely to be less than dietary exposure to the chemical as a food additive and as a natural constituent in foods and pesticidal use of 3-decen-2-one is not likely to result in a significant increase in overall dietary exposure. A detailed discussion of how the Agency arrived at its conclusion is provided in the subsequent paragraphs.

For a discussion of the toxicology data available for the active ingredient refer to the section entitled, "**II. Human Health Assessment**" above. For a discussion of the natural occurrence of 3-decen-2-one in food, the occurrence in food as a food additive and metabolism information, refer to the section entitled, "**1. Subchronic Toxicity: 90-Day Oral Toxicity**" above.

Residues

Previous residue data submitted by the applicant indicate that residues of 3-decen-2-one persist in treated potatoes for up to 61 days post-treatment (after one application), although there is a substantial reduction over time. A previously submitted residue study (MRID 48433201) conducted on potatoes treated with the active ingredient is discussed in the memorandum from C. Walsh to L. Hollis dated 12/20/11. A new residue study conducted on treated potatoes was submitted in MRID 48970304 (a DER was not created for this MRID). The study was performed on stored Ranger Russet potatoes treated with one application of AMV-1018 (the end-use product containing 98% 3-decen-2-one; EPA File Symbol No. 5481-LTR) at twice the maximum application label rate. Potatoes were analyzed for residues when raw, steamed and baked at 1, 3, 5, 7 and 14 days after treatment. The study was terminated after day 14. Prior to cooking and-/or analysis, potatoes were "gently" washed with a vegetable brush. Tubers were prepared by quartering each potato, chopping one of the quarters into cubes, mixing the cubes for random distribution and then storing at -80°C. Residues of 3-decen-2-one were extracted then analyzed by gas chromatography and statistical analysis was performed (refer to p. 8 of 45 in MRID 48970304 for more information). The newly submitted residue data are summarized in Table 2 below.

Table 2: 3-Decen-2-one Residues in Raw, Steamed and Baked Potatoes Treated with 230 mg/kg AMV-1018 (98% 3-decen-2-one)

Days After Treatment	Raw (ppm)	Steamed (ppm)	Baked (ppm)
1	2.224	0.256	0.550
3	1.262	0.255	0.548
7	0.747	0.193	0.347
14	0.459	0.112	0.274

The residue study demonstrated that 3-decen-2-one residues are reduced when potatoes are cooked. Residues remained on all forms of potatoes through 14 days, when the study was terminated. Based on the results of the previously submitted residue study (MRID 48422302) residues of the active ingredient are likely to persist longer than 14 days, although they decrease over time. It is noted that since potatoes were "gently" washed with a vegetable brush prior to residue analysis, some residues of the active ingredient were likely washed off. Per the applicant, potatoes were washed to simulate normal behavior of consumers who generally wash potatoes prior to cooking and eating.

Comparison of Dietary Exposure from Different Sources of 3-Decen-2-One

A deterministic quantitative evaluation of potential dietary exposure to children from consumption of pesticide-treated potatoes was conducted and compared to estimated dietary exposure to 3-decen-2-one as a natural constituent of food and as a food additive. Children (1 to 2 years old) were chosen as a representative subpopulation to assess exposure due to their relatively high consumption of potatoes and potato-products relative to body weight. The assessment indicates that overall dietary exposure to the chemical, from its presence as a naturally-occurring component in foods or as a food additive, is not likely to substantially increase from exposure via consumption of potatoes treated with the active ingredient as a pesticide when label instructions are followed.

Dietary exposure to 3-decen-2-one as a natural constituent in foods was evaluated by using a quantitative estimate of the amount of the chemical present in fermented milk (yogurt) and calculating the potential exposure to children, aged 1-2 years. The applicant identified two scientific articles providing information needed to estimate the naturally occurring levels of 3-decen-2-one. The active ingredient has been identified by gas chromatography (GC) as a volatile constituent in four types of yogurt (Patrignani et al., 2009); however, the amount was not quantified. In another study where some volatile constituents of yogurt were analyzed (Ott et al., 2000), the amount of acetaldehyde present in five different types of yogurt was quantified as an average concentration of 10.8 ppm. Acetaldehyde was also identified in the Patrignani study, but was not quantified. Because acetaldehyde was the only volatile constituent found in both studies, it was used as a surrogate to estimate the amount of 3-decen-2-one in the Patrignani study. The average amount of acetaldehyde in the yogurt from the Ott study was assumed to be the same as the amount in the yogurt in the Patrignani study. The relationship between the peak areas of 3-decen-2-one and acetaldehyde measured using GC was considered to be equivalent to the relationship between the average concentrations of 3-decen-2-one and acetaldehyde. The amount of the active ingredient was then estimated by dividing the 3-decen-2-one peak area by the acetaldehyde peak area for each of the four yogurt types in the Patrignani study. For the purpose of this assessment, the Agency considers this a reasonable approach for estimation of 3-decen-2-one concentrations in yogurt. The yogurts were analyzed twice during the study, once after one day, and then again after 14 days of storage; therefore, instead of four concentration estimates, eight estimates of 3-decen-2-one concentrations were calculated. These concentrations ranged from 2.15-11.15 ppm with the average of 7.64 ppm. To estimate the average amount of yogurt consumed by children per day, EPA's Exposure Factors Handbook (US EPA, 2011) was consulted; the mean per capita yogurt intake by children aged 1-2 years is estimated to be 12 g/day; the

consumer-only intake was not available. With regard to this assessment, the per capita intake is the average yogurt consumed per person in a population of both individuals who ate yogurt during a specified time and those who did not and the consumer-only intake is the average yogurt consumed per person in a population composed only of people who ate yogurt during a specified period. The Exposure Factors Handbook (EFH) indicates that approximately 8.4% of the age group consumes yogurt. It is anticipated that the consumer-only intake is considerably higher (for perspective, a 3.5 oz container of yogurt weighs approximately 100 g). Using the average estimated concentration of 3-decen-2-one in yogurt and the average amount of yogurt consumed by children per day, an estimate of dietary exposure was calculated. The concentration of the active ingredient (ppm, or µg/g) is multiplied by the grams of yogurt consumed per day; the resulting number is then adjusted for inclusion of body weight (the average body weight of a child aged 1-2 years is 11.4 kg (EFH, 2011). Assuming consumption of 12 g yogurt/day, the dietary exposure for children is as follows:

7.64 µg 3-decen-2-one/g yogurt × 12 g yogurt consumed/day = 91.68 µg 3-decen-2-one/day;

91.68 µg/day ÷ 11.4 kg bodyweight = **8.04 µg 3-decen-2-one/kg body weight/day**

Thus, the estimated exposure to 3-decen-2-one of a child consuming 12 g of yogurt per day is 8.04 µg/kg bw/day. To account for the lack of consumer-only intake data and to use a more conservative approach, an estimate of 50 g yogurt (which is approximately half of a 3.5 oz container of yogurt) consumed per day was employed. Using this consumption amount and the same calculation presented above, the estimated exposure of a child consuming 50 g of yogurt per day is **33.5 µg/kg bw/day**. Based on these data, the amount of the chemical consumed by children aged 1-2 years is estimated to range from **8.04-33.5 µg/kg bw/day.**

Dietary exposure to 3-decen-2-one as a food additive was also evaluated using the same methodology and calculations presented above and the levels of the chemical added to food as described by Oser and Ford (1978), which is discussed above in the section entitled, "**1. Subchronic Toxicity: 90-Day Oral Toxicity**". Based on the Oser and Ford report, the chemical is considered safe for its intended use when added to baked goods at an average maximum of 19 ppm and to nonalcoholic beverages at an average maximum of 4.3 ppm. According to the EFH, the average daily per capita intake of bread (includes breads, rolls, muffins, bagels, biscuits, cornbread and tortillas) for children aged 1-2 years is 2 g/kg bw/day. The average per capita intake of non-citrus juices and nectars and citrus juices is 132 g/day and 49 g/day, respectively. The juice intake values were chosen as reasonable representations for nonalcoholic beverages that children may ingest. Because the amounts of 3-decen-2-one added to food are considered maximum amounts, two calculations for each food group were performed to create a range of dietary exposure estimates. The first estimate is based on exposure to the maximum amount of the chemical added to the specific food group and the second estimate is based on the maximum amount of the chemical divided in half. The division is considered a reasonable estimate for levels of 3-decen-2-one that may be generally added to food and is useful in creating a range of possible dietary exposures. For example, for baked goods, the maximum amount of the chemical added can be 19 ppm; to estimate dietary exposures, concentrations of 19 ppm and 9.5 ppm were used in the calculations. Assessments similar to those discussed regarding dietary exposure to 3-decen-2-one in yogurt suggest a range of dietary

exposures of **19.0-38.0 µg/kg bw/day** in baked goods and **9.24-49.8 µg/kg bw/day** (24.9-49.8 µg/kg bw/day in non-citrus juices and nectars and 9.2 - 18.5 µg/kg bw/day in citrus juices) in nonalcoholic beverages. Dietary exposure to 3-decen-2-one from its use as a pesticide was evaluated by using the residue data presented in Table 2 above and similar calculations to those discussed above. Residues of 0.550 ppm 3-decen-2-one were identified in potatoes that were baked one day after treatment with double the application rate on the label. The residue value for baked potatoes was selected since children are not likely to eat raw potatoes. The label indicates that 4 applications of the pesticide can be made in 7-day increments. A conservative estimate of potential residues after four pesticide applications was conducted by using the residue value for baked potatoes at day 1 and multiplying that value by four. The estimate is conservative because it is assumed that four applications of the pesticide will be made all at one time and potatoes will be consumed at day 1 after treatment when in reality, the pesticide will not be applied all in one interval and residue data indicate that levels of 3-decen-2-one decline in potatoes over time. According to the EFH, the average consumer-only intake of white potatoes by children aged 1-2 years is 1.86 g/kg bw/day (uncooked weight). Using the type of calculations discussed above, the estimated dietary exposure to children from exposure to 3-decen-2-one as a pesticide is **4.1 µg/kg bw/day.**

A summary of estimated dietary exposures for children aged 1-2 years as calculated and discussed above is presented in Table 3 below.

Table 3: Estimated Dietary Exposures to 3-decen-2-one for Children Aged 1-2 Years

Source of 3-decen-2-one	Estimated Dietary Exposure (µg/kg bw/day)
Naturally-occurring constituent of yogurt	8.0 - 33.5
Food additive in baked goods	19.0 – 38.0
Food additive in nonalcoholic beverages: Non-citrus juices and nectars Citrus juices	 24.9 – 49.8 (non-citrus) 9.24 -18.5 (citrus)
Pesticide residues on baked potatoes	4.1

The information presented above suggests that dietary exposure to residues of 3-decen-2-one used as a pesticide is likely to be less than dietary exposure to the chemical when present as a naturally-occurring constituent in food and/or as a food additive. Further, when compared to the amount of the chemical that is likely already consumed in the human diet, pesticidal use is not anticipated to significantly increase overall human dietary exposure to 3-decen-2-one.

2. Drinking Water Exposure and Risk Characterization

Based on the proposed use pattern of the active ingredient as a potato sprout inhibitor used in indoor settings, residues in drinking water are not anticipated if products are used according to label instructions. Products containing the active ingredient will be used in indoor commercial settings only; therefore, 3-decen-2-one residues in drinking water are highly unlikely.

3. Acute and Chronic Dietary Risks for Sensitive Subpopulations Particularly Infants and Children

The Agency has determined that there are no foreseeable dietary risks to sensitive subpopulations, including infants and children, from the use of 3-decen-2-one as a pesticide on stored potatoes when label instructions are followed. The available data and information indicate that the chemical: 1) is of low toxicity and is not likely a developmental toxicant; 2) naturally occurs in the human diet; 3) has been approved for use in foods as a food additive by the FDA without limitation; and 4) is metabolized into innocuous substances. Additionally, basic exposure analyses that were specifically conducted for children aged 1-2 years suggest that dietary exposure from ingestion of the chemical as a pesticide is likely to be less that dietary exposure from ingestion of the chemical as a food additive and/or as a constituent that naturally occurs in foods. When compared to the amount of 3-decen-2-one that is likely already consumed in the human diet, dietary exposure from pesticidal use is not anticipated to significantly increase overall dietary exposure of infants and children.

D. Occupational, Residential, School and Day Care Exposure and Risk Characterization

1. Occupational Exposure and Risk Characterization

Refer to the memorandum from C. Walsh to L. Hollis dated 12/20/11.

2. Residential, School and Day Care Exposure and Risk Characterization

Refer to the memorandum from C. Walsh to L. Hollis dated 12/20/11.

E. Aggregate Exposure from Multiple Routes Including Dermal, Oral, and Inhalation

Aggregate exposure to 3-decen-2-one is not anticipated based on the available data and information. This includes all exposures for which there is reliable information. Based on the use pattern of the chemical as a sprout inhibitor on stored potatoes in a closed system and appropriate personal protective equipment (PPE) requirements on the label, significant exposure via the dermal and inhalation routes is not anticipated when label instructions are followed. Dietary (oral) exposure has been identified as the only likely route of exposure. Exposure is not anticipated in drinking water based on the use pattern and the pesticide is not to be used in residential settings. The chemical's highly specific mode of action as a sprout inhibitor, its low toxicity (with the exception that 3-decen-2-one is an eye and skin irritant) further support the EPA's conclusion. In consideration of the above information, the Agency has determined the risk from aggregate exposure (via oral, dermal, and inhalation exposures) is negligible.

F. Cumulative Effects

EPA has considered the potential for cumulative effects of 3-decen-2-one and other substances in relation to a common mechanism of toxicity. Unlike other pesticides for which EPA has followed a cumulative risk approach based on a common mechanism of toxicity, the Agency has not made a common mechanism of toxicity finding for 3-decen-2-one and any other substances and 3-decen-2-one does not appear to produce a toxic metabolite produced by other substances. The active ingredient is a biopesticide that has a nontoxic mode of action. For information regarding EPA's efforts to determine which chemicals have a common mechanism of toxicity and to evaluate the cumulative effects of such chemicals, see the policy statements released by the Agency's Office of Pesticide Programs concerning common mechanism determinations and procedures for cumulating effects from substances found to have a common mechanism on EPA's website at http://www.epa.gov/pesticides/cumulative/.

G. Risk Characterization

The Agency has considered human exposure to 3-decen-2-one in light of the relevant safety factors in FQPA and FIFRA. A determination has been made that no unreasonable adverse effects to the U.S. population in general, and to infants and children in particular, will result from the use of 3-decen-2-one as a pesticide when label instructions are followed.

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cc: A. L. Gonzales, F. Fort, C. G. Walsh, BPPD Science Review File, IHAD/ARS
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